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CRANBERRY CULTURE.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
Washington, D. C., June 1, 1903.

SIR: I have the honor to transmit herewith a paper on Cranberry Culture, written by Mr. L. C. Corbett, Horticulturist of this Bureau, and recommend that it be published as a Farmers' Bulletin.

Respectfully,

B. T. GALLOWAY,
Chief of Bureau Plant Industry.

HON. JAMES WILSON,
Secretary of Agriculture.

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CRANBERRY CULTURE.

INTRODUCTION.

The cranberry of commerce, known to botanists by the name *Vaccinium macrocarpon*, is native to a narrow belt of country along the Atlantic coast from Maine to New Jersey and in isolated areas along the Allegheny Mountains from southern Pennsylvania to North Carolina. In the central United States the plant is found in Michigan, Wisconsin, and Minnesota.

The successful commercial developments in the cranberry industry have very generally been found in localities where the cranberry occurs as a native plant. The areas from which the crop is reported as a commercial industry are indicated by the black dots on the map (fig. 1), while areas in which the plant is known to occur in a wild state, but in which no commercial industry at present exists, are indicated by circles. A glance at the map reveals at once the regions in which the cranberry is now grown, as well as the region to which it is indigenous.

The earliest plantings of the cranberry were made in the Cape Cod region of Massachusetts in the first quarter of the nineteenth century, probably between 1800 and 1818. From a meager start the industry has grown to one of first magnitude and has been extended into other States, as shown by the accompanying table taken from the census of 1900.

Acres and yield by States.

States.	Acres.	Bushels.	Average number bushels per acre.
Connecticut	275	6,921	25
Illinois	1	53	53
Indiana	70	4,360	62
Iowa	1	61	61
Kansas	1	36	36
Maine	90	1,554	17
Massachusetts	5,128	598,906	117
Michigan	150	3,884	26
Minnesota	22	1,120	51
Nebraska	1	20	20
New Hampshire	23	973	42
New Jersey	8,356	230,221	29
New York	113	10,877	96
North Dakota	1
Oregon	6	712	119
Rhode Island	300	6,559	22
South Dakota	1	22	22
Washington	5	138	28
Wisconsin	5,821	111,098	19

SPECIES AND DESCRIPTION.

Two species of cranberries occur within the natural cranberry territory of this country. One is known as the Little Cranberry, *Vaccinium*

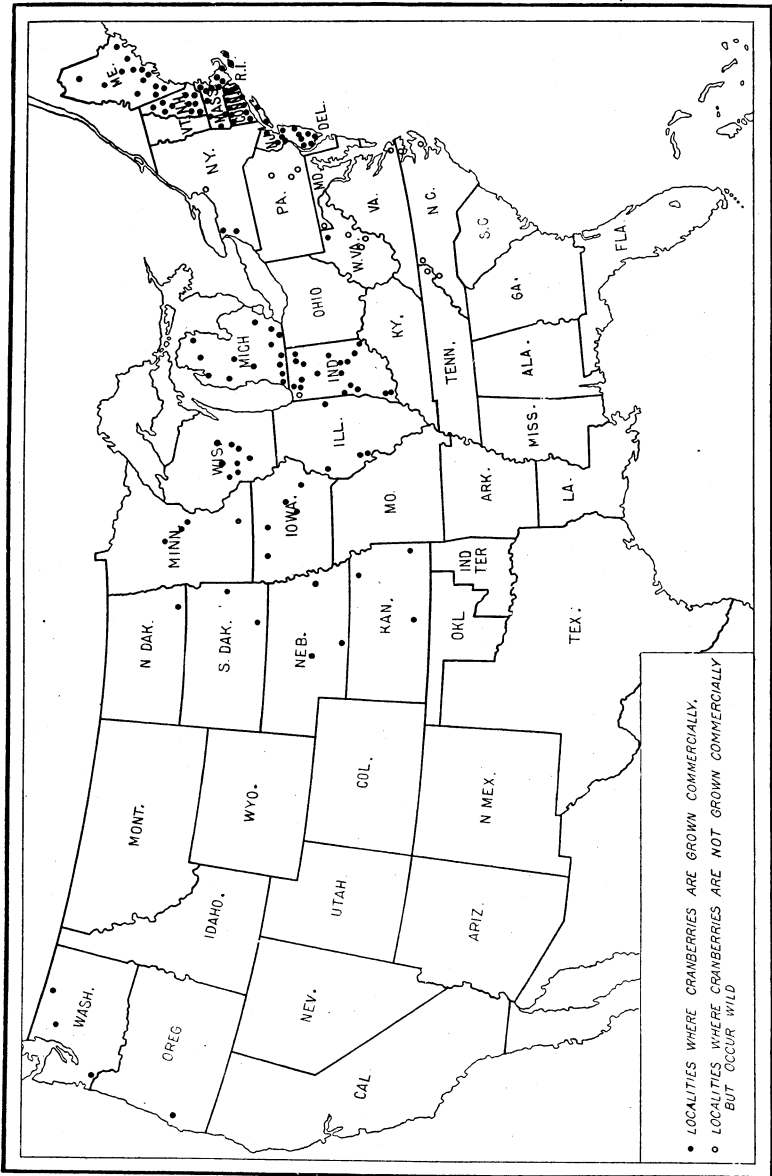


Fig. 1.—Map showing localities in which cranberries are grown commercially and where they occur wild.

oxycoccus Linn., and the other as the Large or American Cranberry, *Vaccinium macrocarpon* Ait.

THE PLANT.

The small cranberry, *V. oxycoccus* Linn., is the Old World kind. It is a slender, creeping plant, with short filiform stems four inches to one foot long; leaves ovate, acute, or acuminate, $\frac{1}{4}$ inch long, with revolute margins; pedicels 1 to 4, terminal; corolla deeply 4-parted, the lobes reflexed; anthers exserted, with very long terminal tubes; berry red, globose, $\frac{1}{4}$ to $\frac{1}{3}$ inch in diameter, 4-loculed. It is indigenous to sphagnum swamps in subarctic and Alpine regions of both Europe and America. In the United States it is reported from New England, Pennsylvania, Wisconsin, Michigan, and the Pacific Northwest.

The large or American cranberry, *V. macrocarpon* Ait., is a plant of low creeping habit, stems slender, elongated 1 to 4 feet, the flowering branches ascending; leaves oblong or oval, obtuse or retuse, $\frac{1}{3}$ to $\frac{1}{2}$ inch long, whitened beneath; pedicels, several, axillary and lateral; berry, red or reddish globose or pyriform, $\frac{1}{3}$ to 1 inch long. Its general distribution is stated in the first paragraph of this bulletin.

THE FRUIT.

The fruit of the cranberry is borne on short upright shoots of the previous season's growth, as shown in fig. 2. As will be noted in

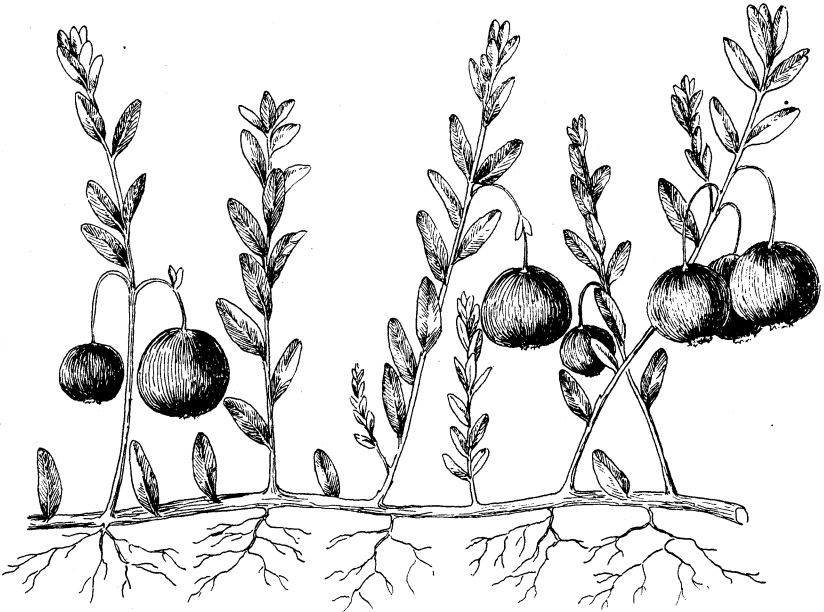


FIG. 2.—Bearing habit of cranberry; berries borne on one-year-old shoots.

the drawing, the flowers are borne in the axils of the leaves, one to three or four in a place, which gives the fruit the appearance of being distributed along the stem, a fact which is taken advantage of in

harvesting. The mechanical devices used for this purpose are constructed so as to take advantage of this peculiarity.

Structurally, both species of the cranberry are closely allied to the so-called huckleberries. Botanically, they are classed merely as distinct species, all the blueberries, huckleberries, and cranberries being grouped in the one family (*Ericaceæ*). Of this group, many of which produce delicious dessert and culinary fruits, the cranberry is the only one which has been improved and extensively cultivated. It is also worthy of note as being one of the native fruits of America which has become an important commercial product and has won for itself a world-wide reputation.

CONDITIONS ESSENTIAL TO SUCCESS IN CRANBERRY CULTURE.

SOIL.

All economic plants show a preference for certain soil and climatic conditions, and none is more exacting in this regard than the cranberry. While it can be easily and successfully grown on congenial soils, it can not be made to return paying crops under adverse conditions.

The conditions necessary for success in cranberry culture are soils of a peaty or alluvial nature, located at high altitudes or in high latitudes, and provided with an ample and easily available water supply and an easily accessible supply of sand. Repeated failures have resulted from attempts to establish cranberry plantations on soils not congenial to the plant. The best index to the fitness of the soil for this crop is the occurrence of native cranberry plants. Where the cranberry is indigenous to the soil it is safe to undertake the commercial cultivation of the crop. The commercial cranberry bog or meadow should combine as many as possible of the elements which characterize the natural habitat of the cranberry, with all possible appliances for controlling adverse conditions. While the cranberry is not a water plant, it thrives best on soils in which the water level is within a few inches of the surface of the soil. It is desirable that the arrangements be such as to render it possible to maintain a constant water level throughout the growing season, and at the same time to hold this at the depth of 8 or 10 inches below the surface, particularly during the first three years of the existence of the plantation. The supply of water should also be sufficient and the plantation so provided with dikes as to allow of flooding the area with water to the depth of 18 inches to 2 feet from November to May in localities where it is necessary to protect the plants from insects and from late spring frosts.

CLIMATE.

At present the important commercial cranberry areas of the United States are situated in Massachusetts, New Jersey, and Wisconsin, with

minor fields in Connecticut, Illinois, Indiana, Iowa, Kansas, Maine, Michigan, Minnesota, Nebraska, New Hampshire, New York, North Dakota, Oregon, Rhode Island, Washington, and West Virginia. The accompanying map (fig. 1), prepared from the last census, indicates in a graphic manner the location of the cranberry districts of the United States. This map is interesting because it suggests the limits of successful cranberry culture and at the same time gives a very definite idea of the distribution of the native plant. It is evident from the map that many of the possible areas for cranberry culture have not yet been taken up. Another point clearly brought out in the distribution of the plant is its limitation by climatic conditions. While it occurs as far south as Tennessee and North Carolina along the Allegheny Mountains, the high altitude has provided conditions under which a congenial environment for the plant has been maintained with a consequent preservation of the species in these now isolated areas.

PREPARATION FOR PLANTING.

TURFING.

The first step in preparing a cranberry bog or meadow is to eradicate all bushes and tree growth. Following this, all surface vegetation should be removed. This operation, called "turfing," consists in removing the top layer of soil to the depth of from 2 to 4 inches according to the character of the vegetation, the object being to cut deep enough to destroy the crowns and roots of all plants which might prove troublesome as weeds in the cranberry plantation. Because of the boggy nature of the land usually selected for the cranberry marsh the work of turfing must be done by hand. Where the soil is firm and animals can be used, strongly constructed sod cutters may prove useful.

GRADING.

After the turf has been removed the surface of the area to be planted must be graded so as to make it practically level. The object of this is to maintain the water level at a uniform depth below the surface of the soil and at the same time to make it possible to flood the area with a minimum quantity of water. In addition to leveling the surface, dams necessary to store a sufficient quantity of water to flood the area will be needed. The plantation will require embankments of sufficient height around its border to maintain the desired depth of water over the surface of the planted area. Ditches to remove surface water or the water from springs during the growing season will also be necessary. These can be so graded as to maintain the water level in the soil at the height desired.

SANDING.

After the surface of the area to be planted has been brought to the desired grade and the surface soil given a thorough cultivation and again compacted the area is ready for sanding. This operation consists in covering the area to be planted to the depth of 3 to 4 inches with a coating of sand free from clay and seed of obnoxious weeds. In the coast regions the sanding of the meadows is a simple matter, as the borders of the bogs are usually made up of sand blown in from the ocean. Interior regions usually present much greater difficulties; frequently the sand must be hauled several miles, but as the subsequent cost of caring for the meadow is largely determined by the care in sanding, the operation is of much more importance than would at first thought appear. In the Cape Cod region sanding is done almost entirely by hand labor. The sand is carried in wheelbarrows over temporary movable plank tracks from adjoining sand banks to the surface of the bog. The bogs in most cases are too low and soft to allow the use of horses. In sections where the sand must be hauled some distance the ground to be planted is usually sufficiently solid to admit of distributing the sand by horsepower, thus offsetting in large measure the easier accessibility of sanding in the lower coast regions.

PROPAGATION AND PLANTING.

As with all other economic fruits the cranberry is propagated by seeds only for the purpose of originating new sorts. It propagates

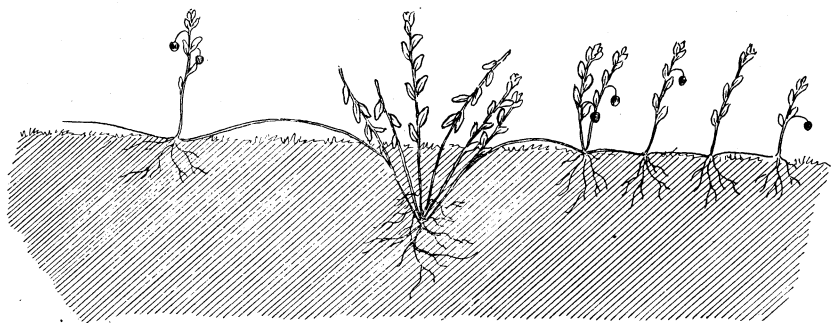


FIG. 3.—Natural manner of propagation.

itself naturally by offsets (fig. 3). Commercial propagation is carried on by use of cuttings or layers.

PROPAGATION FROM SEED.

As with all plants of its class, the cranberry grows best when the seeds are planted immediately after being separated from the pulp of the fruit. There are instances known, however, where dry seeds held from one season to the next have germinated freely. The soil upon

which the seeds are to be sown should consist of fibrous peat with a sufficient admixture of sand to give it drainage and prevent damping off. After the seeds are sown the surface should be given a sprinkling of about one-fourth inch deep of clean sand, maintaining a uniform temperature of 60° to 70° and a high degree of moisture in the soil at all times. If the seeds are sown in flats, this can be accomplished by placing panes of glass over the boxes. The young plants can then be transferred to thumb pots and after becoming well established can be transferred to shaded nursery beds.

CUTTINGS.

New cranberry meadows are almost always established by planting cuttings. The sanded surface of the area to be planted serves as the



FIG. 4.—Dibbling in cranberry cuttings.

propagating bed for the cuttings as well as the home for the established plants.

The cuttings consist usually of portions of shoots of the variety to be grown, 10 to 15 inches long. The common practice is to secure the cuttings from vigorous plants by mowing a portion of the meadow

with a mowing scythe. The portions of the vines thus secured are then transported to the area to be planted and separated into wisps containing from 8 to 15 separate stems. The wisps are placed at the intersection of marks made to indicate the interval between the plants, usually 18 by 18 or 9 by 18 inches. The cuttings are then forced into the sand with a broad, thin, wedge-shaped dibble. The blade of the dibble is placed midway of the wisp of cuttings, so that the pressure exerted upon the cuttings doubles them upon themselves and at the same time presses them firmly in the soil. The operation is illustrated in fig. 4. A cutting in position is shown in fig. 5.

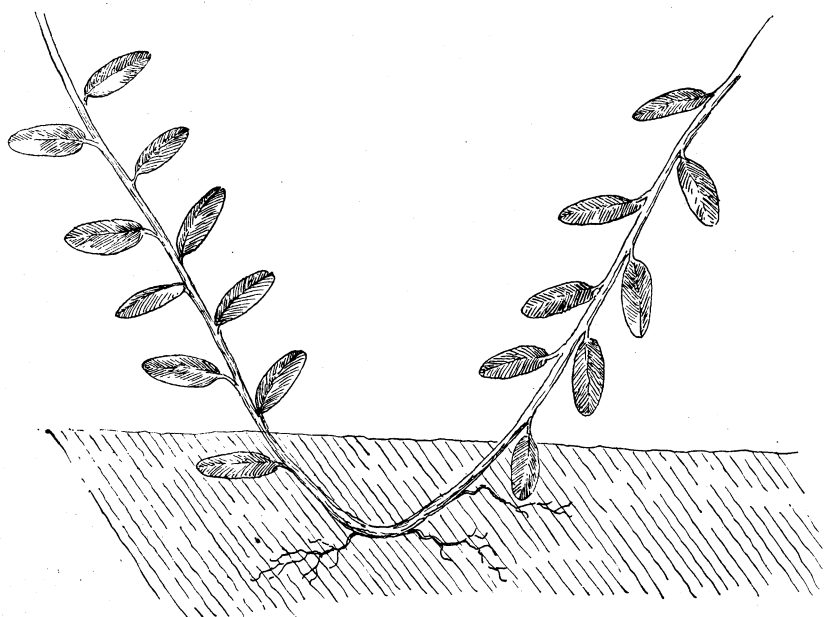


FIG. 5.—Cranberry cutting in position.

While the above statement explains the usual method of propagating the cranberry, new meadows have been established by running the cuttings through an ordinary hay or straw cutter, thus reducing them to fragments about 1 inch long. By sowing these fragments in rows or broadcasting them upon the surface a stand of plants may be secured.

Cuttings of the cranberry intended for shipment should be loosely packed in well ventilated barrels, baskets, or crates. More injury results from the heating of the plants in closely packed unventilated receptacles than from drying in well ventilated ones.

TIME TO PLANT.

Planting (figs. 6 and 7) should be done as early in the spring as cuttings can be secured. Usually this will be about the 1st of June, as the



FIG. 6.—A newly planted cranberry meadow.

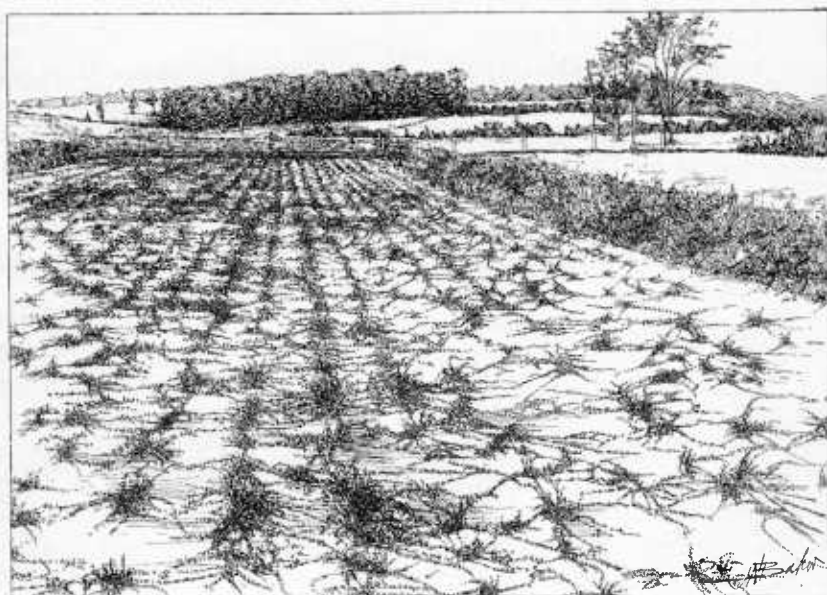


FIG. 7.—A one-year-old cranberry meadow.

bearing meadows from which the cuttings must be secured are usually kept flooded until after the middle of May in order to insure the crop against injury from frosts.

CULTIVATION.

With the cranberry the greater portion of its cultivation is done in preparing the soil before planting the cuttings. After planting the cuttings the only cultivation necessary is to keep down grass and weedy growths of all kinds. As the coating of sand should not be mixed more than is necessary with the substratum of peat or muck, the care of the area consists chiefly in hand pulling the weeds. The use of hand tools is prohibited for the reason just stated, and the use of horsepower because of the softness of the soil.

FLOODING.

The necessity for storage reservoirs and irrigation ditches as well as dikes and drainage channels has been mentioned under the heading of "grading."

Flooding is an important factor in the success of cranberry culture throughout the greater portion of the area over which this plant is grown. A succession of remunerative crops from the same meadow is seldom secured without flooding. The presence of water retards the blooming of the plants until the danger from killing frost has passed. This is undoubtedly the chief benefit to be derived from the water. A lesser benefit is in preventing the plants from being heaved out by repeated freezing and thawing.

It is maintained, also, that flooding protects the plants from the depredations of certain injurious insects, and that certain blights and fungous diseases are prevented. Some growers go so far as to flood the meadows for short intervals after the fruits have been formed in order to destroy certain insects, but this practice is looked upon with distrust by the best growers. While the presence of the water may destroy some of the injurious insects present, the flooding of the vines during their active growing period may, on the other hand, result in more injury to the plantation than in the good resulting from the destruction of the insects. In sections where the blooming period of the plants is much later than the usual date for the last killing frosts flooding is of doubtful value. Certain it is that plantations can be established and brought to bearing without the use of water.^a

During the period when the bog is flooded and coated with ice great care must be exercised during a thaw or heavy rain to prevent an accumulation of water on the bog which will raise the general water level. Any accumulation of water which raises the ice will prove disastrous to the bog, for lifting the ice takes the plants with it, with great injury to the plantation.

^a See W. Va. Bulletin, No. 86.

HARVESTING.

In early days of cranberry culture harvesting was necessarily done by hand. As the industry expanded, the increased demand for pickers rendered it necessary that in order to hold the cost of production within

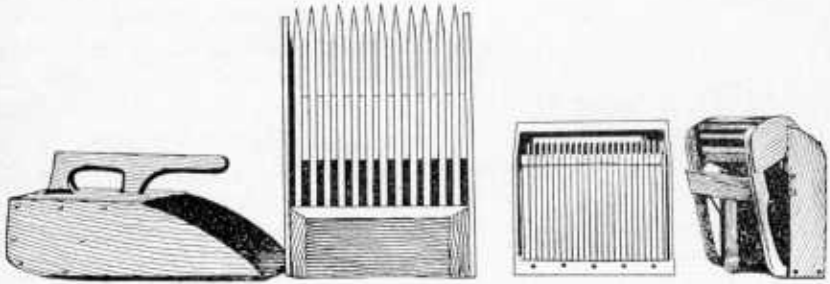


FIG. 8.—Side and bottom views of two cranberry-picking devices.

reasonable bounds some mechanical device be found which would lessen the cost of harvesting by increasing the quantity an individual is able to pick. This demand has been met by two forms of cranberry rake, both of which are illustrated in fig. 8. The one at the left in the

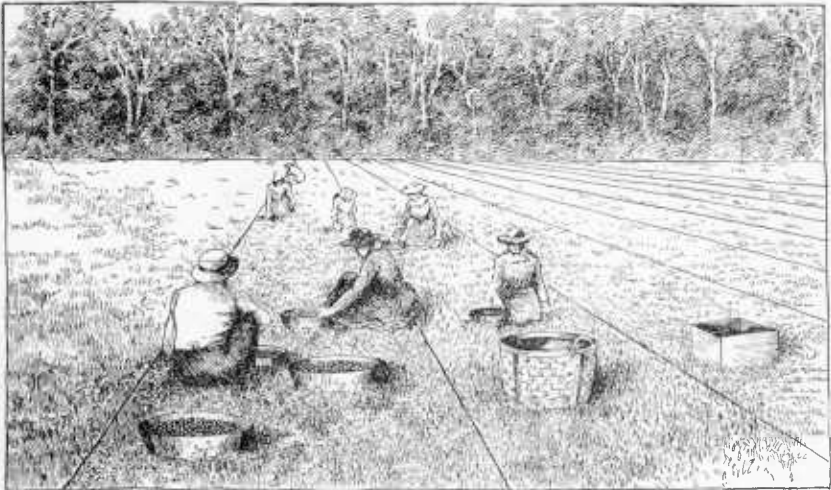


FIG. 9.—Hand picking cranberries; meadow laid off in sections.

drawing is operated by being forced through the branches, thus pulling off the fruit, while that on the right is first forced into the vines, the guard pressed down, and then by withdrawing the implement the berries are stripped off, the shoots upon which the berries are borne

being drawn between the iron fingers of the picker. Either implement effects a decided saving of time and expense, as one person can gather 75 to 80 measures of 6 quarts each in a day, while a hand picker can not gather more than one-half of that quantity. There is considerable prejudice among growers against the use of these harvesting devices because of some real or imagined injury to the bogs. This prejudice, however, seems to be disappearing; at least the use of the harvesters is each year becoming more general.

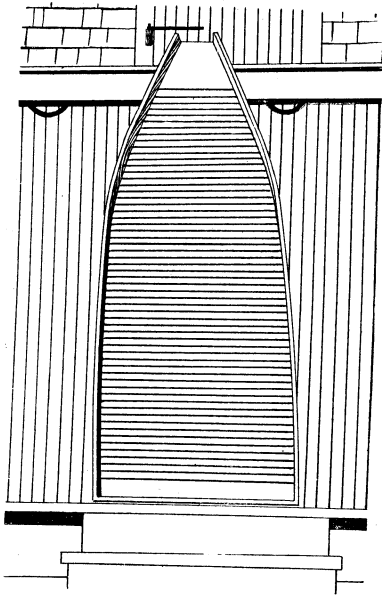


FIG. 10.—Construction of the sorting rack.

Harvesting is paid for, as a rule, by the measure. Each person is furnished with a rake and with pails or boxes in which to place the berries as picked. The meadow is then laid off in sections or strips by stretching lines across it as shown in fig. 9. Each picker is assigned to a division. By this

arrangement each one gets his share both of heavily and sparsely fruited plants, and the grower is certain of getting the product from

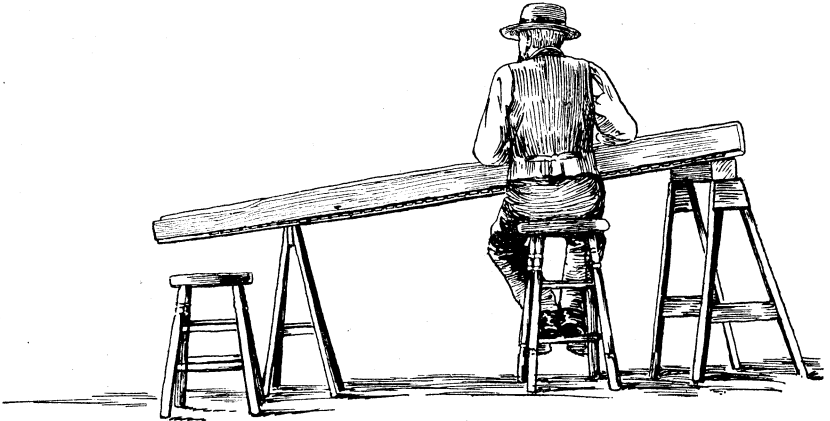


FIG. 11.—Sorting rack in position.

all parts of the meadow. This has not been as satisfactorily accomplished in any other way. After being picked the fruit is carried to storehouses, where it is allowed to remain, until assorted, in the trays

in which it was placed at picking time. The trays are of various dimensions to suit the fancy of the grower, but most of them hold about three measures (18 quarts) of fruit each.

ASSORTING.

As the berries come from the field there are many broken branches, leaves, and defective fruits among them. To remove the leaves and branches, various cleaning devices similar to the fanning mills used for cleaning grain have been invented. After having been winnowed in this fashion the fruit is spread upon assorting racks, the general form of which is shown in figs. 9, 10, and 11. Operators sitting upon either side of this device look over the berries in much the same manner as beans are looked over in hand picking. (See fig. 11.) From the assorting table the berries go into barrels, a few only being crated.

STORING.

Cranberries as they come from the field are immediately placed in storage buildings upon the plantation. It is the prevailing practice to hold the fruit in the storage houses at the bogs until the market is ready, which is from six weeks to three months after harvest. No artificial cold is needed in the storage houses. The only precaution necessary is to prevent the fruit from freezing, which frequently requires the use of a little heat in the storage house.

In early times it was thought necessary to pack the berries in casks and cover them with water in order to preserve them for any length of time, but this idea has been abandoned, and the fruit is for the most part stored in small open boxes.

MARKETING.

The fruit, as cleaned, assorted, and barreled, usually in ventilated barrels, is put on the market. The barrels are similar to those used for packing apples for the domestic market, and are practically of the same size. In the retail stores cranberries are more often found in bushel crates than in barrels. The crating of the fruit is done by the middlemen, who act as distributing agents, rather than by the producers. The dealers prefer that the growers pack the product in barrels.

PRICES.

By an examination of the price lists of the New York market from 1870 to 1902 it is found that the prices of cranberries have varied widely in that time. The lowest ranges of prices quoted were in April, 1879, when the berries sold at \$3.50 to \$4 a barrel; November, 1889, \$4 to \$7.50; April, 1889, \$3.50 to \$5.50; November, 1896, and January, 1897, \$5 to \$5.50; April, 1897, \$3.50 to \$5; and November, 1901, \$6 to

\$7. The highest prices noted were \$15 to \$16 a barrel in April, 1874; \$14 to \$15 in April, 1876; \$13 to \$13.50 in January, 1884; \$13 to \$14 in March, 1895; and \$10 to \$12 in January, 1903. No prices are accessible for 1880, 1881, 1882, 1884, 1885, 1887, and 1888. The usual price has been from \$7 to \$10 a barrel.

VARIETIES.

SELECTION FOR PLANTING.

In the beginning the cranberry grower was wholly dependent upon the native bogs for plants with which to stock his plantations. In some of the most extensive cranberry-growing regions this practice is still common. In those sections where the industry has been developed to its greatest perfection, however, these pioneer methods have been abandoned. Attention is now given to selecting those plants for stock purposes which not only show health and vigor, but which produce fruits of desirable form and color. The result is that there are several well-recognized types of the fruit classified according to form, and each type has several well-defined cultural varieties.

The kinds of cranberries vary as greatly in productiveness and habits of growth as do apples or peaches. As a result of this variation, many of the early planted bogs were not profitable, and had to be torn out and planted with a variety of greater commercial value. As with apples, those sorts which are largest and command highest prices upon the market are frequently shy bearers, and are only grown in limited areas to satisfy the fads of special markets. The question of the varieties best suited to any given section is one of a local nature, and must be determined by trial. In sections yet to be developed it may be found that the climate and soil conditions are particularly well suited to sorts that are shy bearers in the Cape Cod region, or the opposite may be true. For that reason those contemplating taking up this industry in a new section will do well to secure a number of different varieties of good repute from the various cranberry districts, rather than to place entire dependence either upon native stock or even the best sort from any other region. The history of the development of regions growing other standard fruits indicates that varieties are local.

SHAPE OF FRUIT.

The fruit of the native cranberry varies sufficiently in form to warrant a classification based upon this character. Four forms are well defined and easily recognized: The Bell or bell-shaped cranberry; the Bugle or bugle-shaped cranberry; the Olive or olive-shaped cranberry; the Cherry or spherical cranberry.

The Bell cranberry (fig. 12, 2) varies in size and outline from the

Cherry or spherical form (fig. 12, 1) to the more elongated type called "Bugle-shaped," shown in fig. 12, 3. The name was undoubtedly suggested by its fancied resemblance to the form of a bell. In some regions, as in certain sections of New Jersey, this is the most popular form grown, yielding well and producing fruits of high color, flavor, and keeping qualities.

The Bugle cranberry is less frequently met with in the market and in the wild than either the Bell or Cherry types. Its more elongated form suggesting a bugle is undoubtedly responsible for its name.

The Olive-formed cranberry is as its name indicates almost elliptical in outline. Some of the most highly valued sorts are of this form.

The Cherry cranberry may be taken as the natural form of the fruit. In native bogs this is usually the most abundant type, and in most regions where the cranberry is cultivated this type predominates. Its spherical form and size both warrant the use of the name Cherry.

The difficulty with any classification such as the foregoing is the variations which occur even in the same variety. It is possible to find fruits of two or even three types under the same name, and there is much variation in form among the fruits upon the same plant. Every intermediate gradation can be found, from the Bugle type as one extreme to the Cherry type as the other.

There are twenty or more named sorts mentioned in cranberry literature, but the majority of even these are inadequately described and difficult to obtain with fixed characters. The following is a list of the sorts held in highest esteem by growers at the present time:

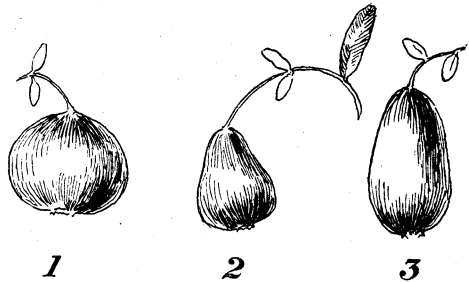


FIG. 12.—Types of cranberry according to shape. 1, Cherry; 2, Bell; 3, Bugle.

Name.	Type.	Name.	Type.	Name.	Type.
Early Black	Bell.	Howe.....	Bugle.	Centennial	Bell.
Early Red	Cherry.	Howes.....	Olive.	Centerville	Bugle.
Mathews	Bugle.	Pride of Hampton	Do.	Dennis	Do.
McFarlins	Olive.	Jumbo.....	Do.	Makepeace	Cherry.
Arpin	Cherry.	Chipman	Bugle.		

IMPROVEMENT.

Until within comparatively recent times the improvement of the cranberry has been almost exclusively by selections from native and cultivated bogs. During the last decade, however, some carefully planned and executed work with seedling plants has been carried on by the Wisconsin Cranberry Growers' Association. This is the line of endeavor most certain to yield satisfactory results. A large number of distinct sorts have been produced and are being subjected to field tests before giving them a name. Besides this there are many distinct types under culture, few of which have trade names. Most of these, it is true, have been taken from the wild, but if distinct and worthy of culture they should be worthy of a name or other satisfactory designation.